

FEATURES

- 10µs Short Circuit Withstand
- High Thermal Cycling Capability
- Soft Punch Through Silicon
- Isolated AISiC Base With AlN Substrates
- Lead Free Construction

APPLICATIONS

- Choppers
- Motor Controllers
- Power Supplies
- Traction Auxiliaries

The Powerline range of high power modules includes half bridge, chopper, dual, single and bi-directional switch configurations covering voltages from 1200V to 6500V and currents up to 2400A.

The DIM400GCM33-F000 is a 3300V, n-channel enhancement mode, insulated gate bipolar transistor (IGBT) chopper module. The IGBT has a wide reverse bias safe operating area (RBSOA) plus 10µs short circuit withstand. This device is optimised for traction drives and other applications requiring high thermal cycling capability.

The module incorporates an electrically isolated base plate and low inductance construction enabling circuit designers to optimise circuit layouts and utilise grounded heat sinks for safety.

ORDERING INFORMATION

Order As:

DIM400GCM33-F000

Note: When ordering, please use the complete part number

KEY PARAMETERS

V_{CES}	3300V
$V_{CE(sat)}$ * (typ)	2.8V
I_C (max)	400A
$I_{C(PK)}$ (max)	800A

* Measured at the auxiliary terminals

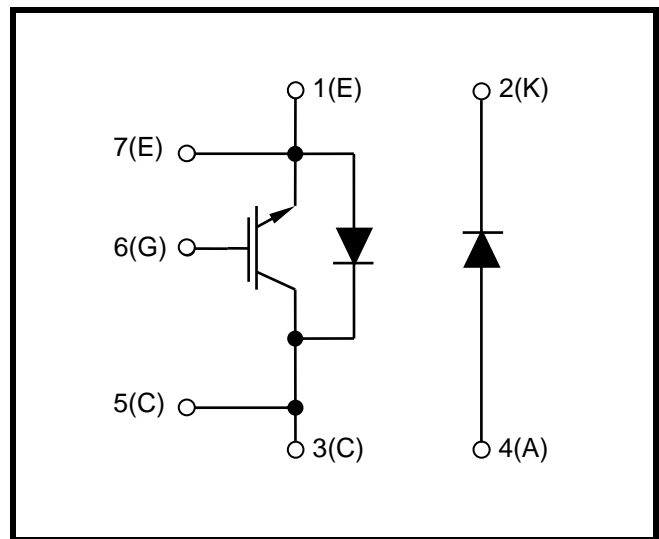


Fig. 1 Circuit configuration



Outline type code: G
(See Fig. 11 for further information)

Fig. 2 Package

ABSOLUTE MAXIMUM RATINGS

Stresses above those listed under 'Absolute Maximum Ratings' may cause permanent damage to the device. In extreme conditions, as with all semiconductors, this may include potentially hazardous rupture of the package. Appropriate safety precautions should always be followed. Exposure to Absolute Maximum Ratings may affect device reliability.

$T_{case} = 25^{\circ}\text{C}$ unless stated otherwise

Symbol	Parameter	Test Conditions	Max.	Units
V_{CES}	Collector-emitter voltage	$V_{GE} = 0\text{V}$	3300	V
V_{GES}	Gate-emitter voltage		± 20	V
I_C	Continuous collector current	$T_{case} = 90^{\circ}\text{C}$	400	A
$I_{C(PK)}$	Peak collector current	1ms, $T_{case} = 115^{\circ}\text{C}$	800	A
P_{max}	Max. transistor power dissipation	$T_{case} = 25^{\circ}\text{C}$, $T_j = 150^{\circ}\text{C}$	5200	W
I^2t	Diode I^2t value (IGBT arm)	$V_R = 0$, $t_p = 10\text{ms}$, $T_j = 125^{\circ}\text{C}$	80	kA^2s
	Diode I^2t value (Diode arm)		80	kA^2s
V_{isol}	Isolation voltage – per module	Commoned terminals to base plate. AC RMS, 1 min, 50Hz	6000	V
Q_{PD}	Partial discharge – per module	IEC1287, $V_1 = 3500\text{V}$, $V_2 = 2600\text{V}$, 50Hz RMS	10	pC

THERMAL AND MECHANICAL RATINGS

Internal insulation material:	AlN
Baseplate material:	AlSiC
Creepage distance:	33mm
Clearance:	20mm
CTI (Comparative Tracking Index):	350

Symbol	Parameter	Test Conditions	Min	Typ.	Max	Units
$R_{th(j-c)}$	Thermal resistance – transistor (per arm)	Continuous dissipation – junction to case	-	-	24	$^{\circ}\text{C}/\text{kW}$
$R_{th(j-c)}$	Thermal resistance – diode (IGBT arm)	Continuous dissipation – junction to case			48	$^{\circ}\text{C}/\text{kW}$
	Thermal resistance – diode (Diode arm)				48	$^{\circ}\text{C}/\text{kW}$
$R_{th(c-h)}$	Thermal resistance – case to heatsink (per module)	Mounting torque 5Nm (with mounting grease)	-	-	8	$^{\circ}\text{C}/\text{kW}$
T_j	Junction temperature	Transistor	-	-	150	$^{\circ}\text{C}$
		Diode	-	-	125	$^{\circ}\text{C}$
T_{stg}	Storage temperature range	-	-40	-	125	$^{\circ}\text{C}$
	Screw torque	Mounting – M6	-	-	5	Nm
		Electrical connections – M4	-	-	2	Nm
		Electrical connections – M8	-	-	10	Nm

ELECTRICAL CHARACTERISTICS
T_{case} = 25°C unless stated otherwise.

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
I _{CES}	Collector cut-off current	V _{GE} = 0V, V _{CE} = V _{CES}			2	mA
		V _{GE} = 0V, V _{CE} = V _{CES} , T _{case} = 125°C			30	mA
I _{GES}	Gate leakage current	V _{GE} = ± 20V, V _{CE} = 0V			1	µA
V _{GE(TH)}	Gate threshold voltage	I _C = 40mA, V _{GE} = V _{CE}	5.5	6.5	7.0	V
V _{CE(sat)}	Collector-emitter saturation voltage	V _{GE} = 15V, I _C = 400A		2.8		V
		V _{GE} = 15V, I _C = 400A, T _j = 125°C		3.6		V
I _F	Diode forward current	DC		400		A
I _{FM}	Diode maximum forward current	t _p = 1ms		800		A
V _F †	Diode forward voltage (IGBT arm)	I _F = 400A		2.9		V
	Diode forward voltage (Diode arm)			2.9		V
	Diode forward voltage (IGBT arm)	I _F = 400A, T _j = 125°C		3.0		V
	Diode forward voltage (Diode arm)			3.0		V
C _{ies}	Input capacitance	V _{CE} = 25V, V _{GE} = 0V, f = 1MHz		72		nF
Q _g	Gate charge	±15V		10		µC
C _{res}	Reverse transfer capacitance	V _{CE} = 25V, V _{GE} = 0V, f = 1MHz				nF
L _M	Module inductance – per arm			25		nH
R _{INT}	Internal resistance – per arm			260		µΩ
SC _{Data}	Short circuit current, I _{SC}	T _j = 125°C, V _{CC} = 2500V t _p ≤ 10µs, V _{GE} ≤ 15V V _{CE(max)} = V _{CES} - L* x di/dt IEC 60747-9		1850		A

Note:

† Measured at the power busbars, not the auxiliary terminals

* L is the circuit inductance + L_M

ELECTRICAL CHARACTERISTICS

$T_{\text{case}} = 25^{\circ}\text{C}$ unless stated otherwise

Symbol	Parameter	Test Conditions	Min	Typ.	Max	Units
$t_{d(\text{off})}$	Turn-off delay time	$I_C = 400\text{A}$ $V_{GE} = \pm 15\text{V}$ $V_{CE} = 1800\text{V}$ $R_{G(\text{ON})} = 5.6\Omega$ $R_{G(\text{OFF})} = 8.2\Omega$ $C_{ge} = 110\text{nF}$ $L_S \sim 100\text{nH}$		2100		ns
t_f	Fall time			210		ns
E_{OFF}	Turn-off energy loss			520		mJ
$t_{d(\text{on})}$	Turn-on delay time			1130		ns
t_r	Rise time			245		ns
E_{ON}	Turn-on energy loss			620		mJ
Q_{rr}	Diode reverse recovery charge		$I_F = 400\text{A}$ $V_{CE} = 1800\text{V}$ $di_F/dt = 2000\text{A}/\mu\text{s}$		160	
I_{rr}	Diode reverse recovery current			330		A
E_{rec}	Diode reverse recovery energy			150		mJ

$T_{\text{case}} = 125^{\circ}\text{C}$ unless stated otherwise

Symbol	Parameter	Test Conditions	Min	Typ.	Max	Units
$t_{d(\text{off})}$	Turn-off delay time	$I_C = 400\text{A}$ $V_{GE} = \pm 15\text{V}$ $V_{CE} = 1800\text{V}$ $R_{G(\text{ON})} = 5.6\Omega$ $R_{G(\text{OFF})} = 8.2\Omega$ $C_{ge} = 110\text{nF}$ $L_S \sim 100\text{nH}$		2150		ns
t_f	Fall time			220		ns
E_{OFF}	Turn-off energy loss			600		mJ
$t_{d(\text{on})}$	Turn-on delay time			1160		ns
t_r	Rise time			285		ns
E_{ON}	Turn-on energy loss			870		mJ
Q_{rr}	Diode reverse recovery charge		$I_F = 400\text{A}$ $V_{CE} = 1800\text{V}$ $di_F/dt = 2000\text{A}/\mu\text{s}$		300	
I_{rr}	Diode reverse recovery current			400		A
E_{rec}	Diode reverse recovery energy			300		mJ

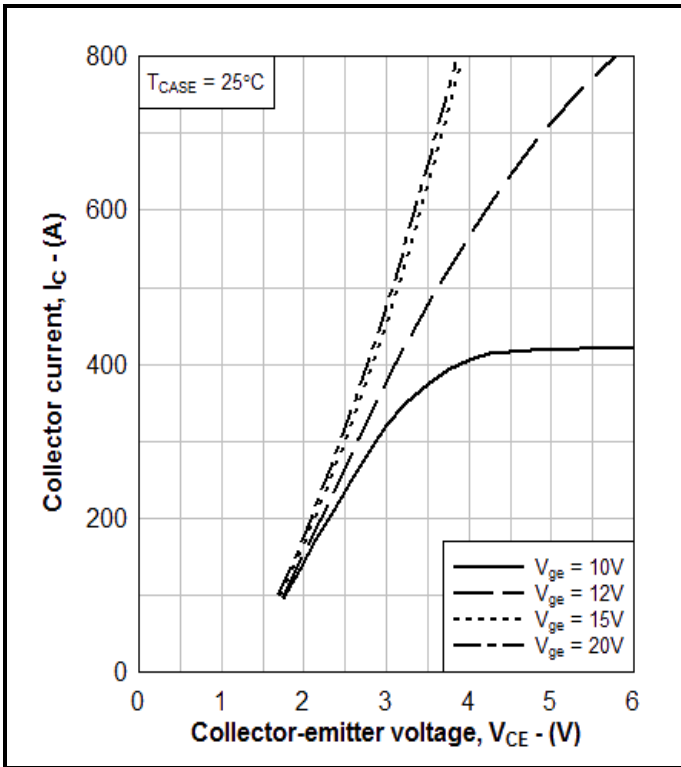


Fig. 3 Typical output characteristics

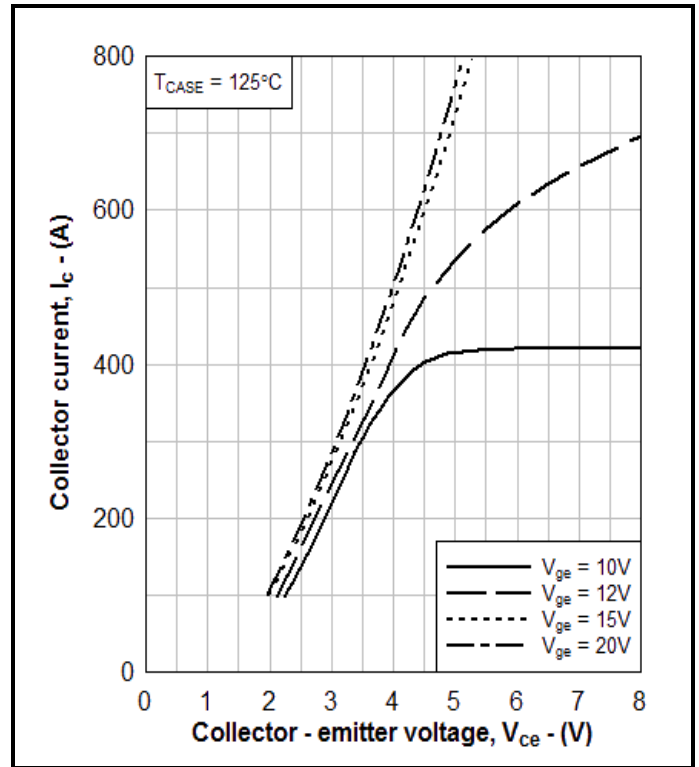


Fig. 4 Typical output characteristics

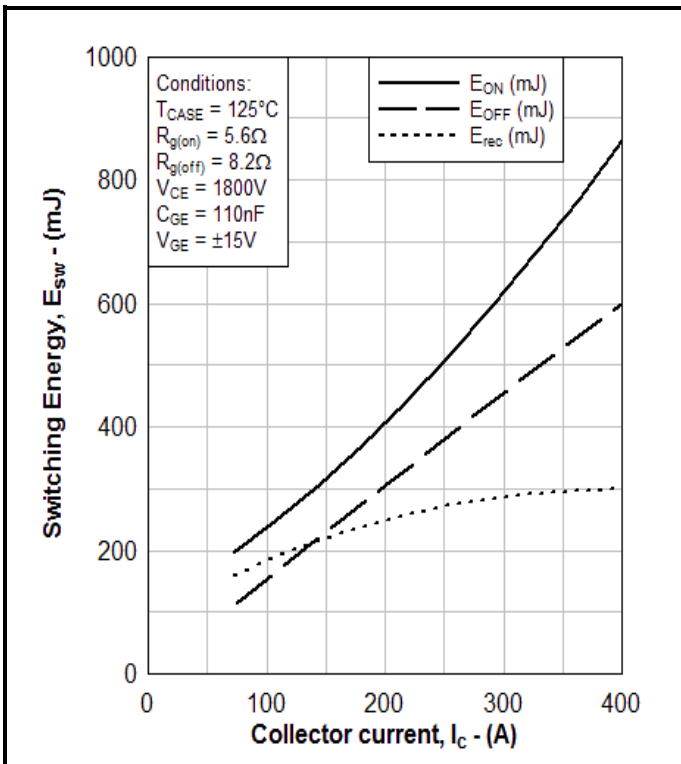


Fig. 5 Typical switching energy vs collector current

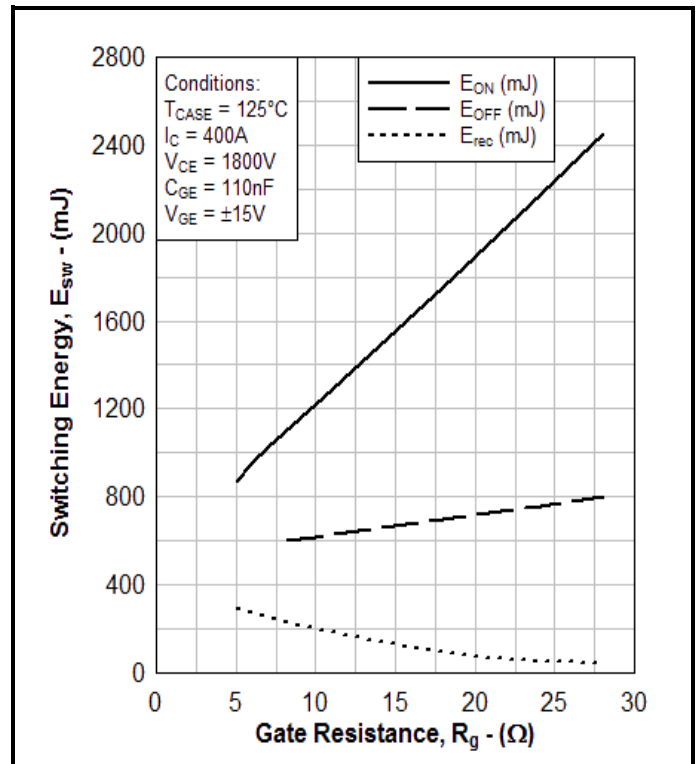


Fig. 6 Typical switching energy vs gate resistance

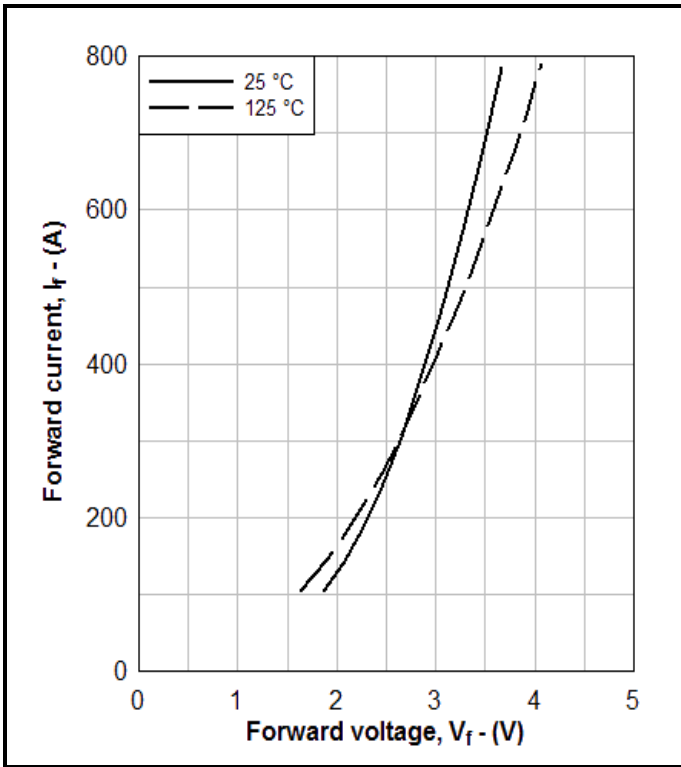


Fig. 7 Diode typical forward characteristics

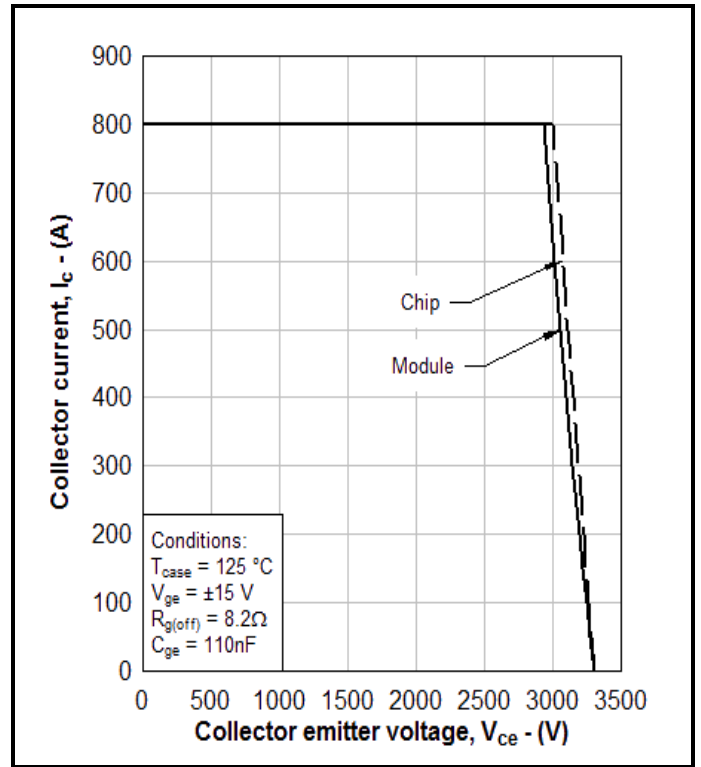


Fig. 8 Reverse bias safe operating area

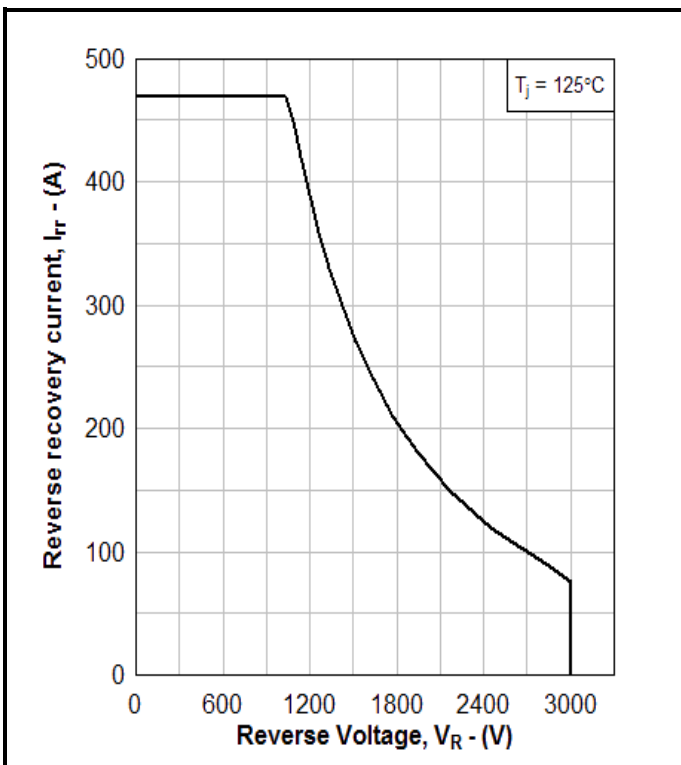


Fig. 9 Diode reverse bias safe operating area

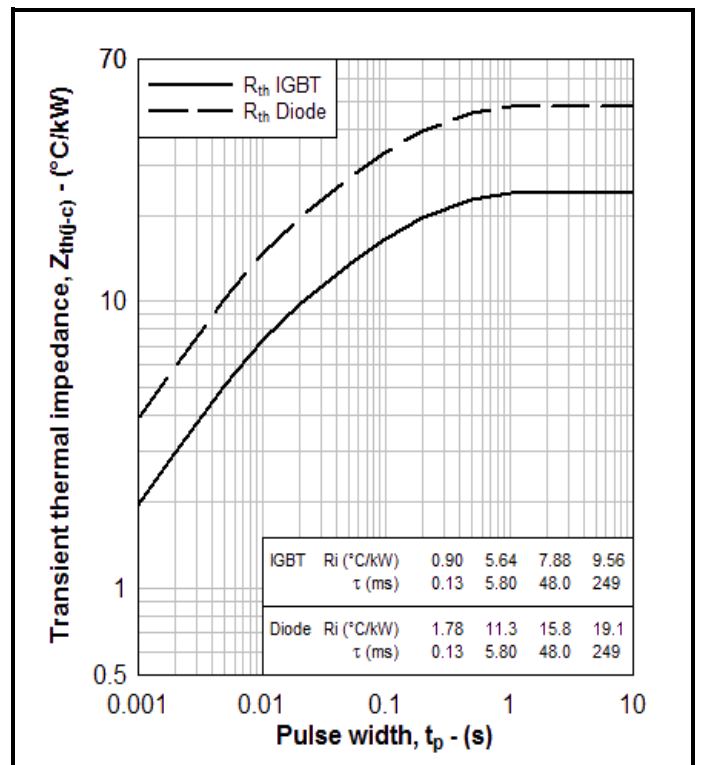
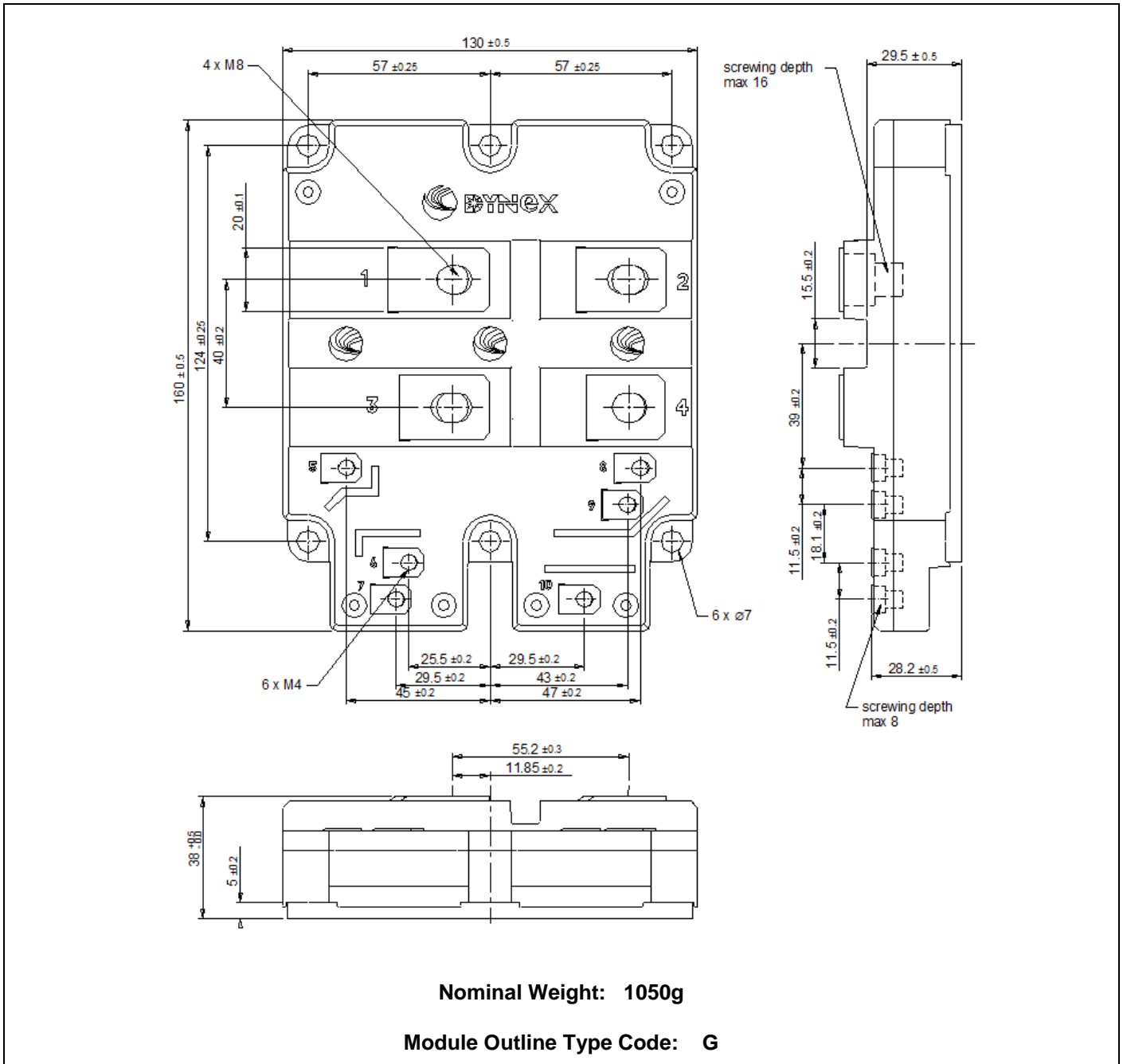


Fig. 10 Transient thermal impedance

PACKAGE DETAILS

For further package information, please visit our website or contact Customer Services.
 All dimensions in mm, unless stated otherwise.
DO NOT SCALE.


Fig. 11 Module outline drawing

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HEADQUARTERS OPERATIONS

DYNEX SEMICONDUCTOR LTD

Doddington Road, Lincoln, Lincolnshire, LN6 3LF,
United Kingdom

Fax: +44(0)1522 500550

Tel: +44(0)1522 500500

Web: <http://www.dynexsemi.com>

CUSTOMER SERVICE

DYNEX SEMICONDUCTOR LTD

Doddington Road, Lincoln, Lincolnshire, LN6 3LF,
United Kingdom

Fax: +44(0)1522 500020

Tel: +44(0)1522 502753 / 502901

Email: Power_solutions@dynexsemi.com